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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/670,975	09/27/2000	Charles E. May	00-140	6488

24319 7590 05/19/2004

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EXAMINER	
KIELIN, ERIK J	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 05/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/670,975	MAY ET AL.	
	Examin r	Art Unit	
	Erik Kielin	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-20* is/are pending in the application.

4a) Of the above claim(s) *9-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7 and 8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10 March 2004 has been entered.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-5, 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As presently written, it is unclear in claim 1 if the any of the thermal transfer media temperature or flow rate, or the process energy is ever changed as a result of a failure of (1) either of the thermal transfer media temperature and the flow rate; (2) the other of the thermal transfer media temperature and the flow rate after one is adjusted; or (3) "both the thermal transfer media temperature and the thermal transfer media flow rate" to change the chuck temperature to the desired level, **because the claim does not require such failure to occur**. Instead the claim requires the adjustment to the temperature changing means **only "if** the sensed chuck temperature is not within the desired range." **The term "if" introduces indefiniteness**

into claim 1 by introducing the option of performing a step or not performing the step. As presently written, then, there exists no requirement for any of the thermal transfer media temperature, the thermal transfer media temperature flow rate, and the process energy to be changed ever because these events only occur when the substrate temperature is outside the desired range. The claims never require the substrate temperature to be outside the range.

As reasonably interpreted, then, claim 1 recites a Markush group of options, wherein in one option none of the thermal transfer media temperature, the thermal transfer media flow rate, and the process energy never has to be changed, so long as the desired chuck temperature is reached. Other options are changing **only one** of the thermal transfer media temperature and the thermal transfer media flow rate and then achieving the desired substrate temperature. Another option is changing **both** the thermal transfer media temperature and the thermal transfer media flow rate and then achieving the desired substrate temperature. Another option is changing all three temperature changing means wherein the thermal transfer media temperature and flow rate are first changed.

For the purposes of patentability, the claims will be interpreted to have the Markush group options. Accordingly, any prior art capable of controlling the temperature of the substrate and having a thermal transfer media temperature and flow control and process energy control still reads on claim 1 so long as the substrate temperature is controlled within a desired temperature range by whatever means, since there exists no requirement for the substrate temperature to be outside the desired range.

The remaining claims are rejected for depending from the above rejected claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5, 7, and 8 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,591,269 (**Arami** et al.).

Regarding claims 1-3, **Arami** discloses a method for controlling a substrate temperature (col. 2, lines 44-47) of a substrate **W** (Fig. 18) during processing of the substrate at a process energy **130**, **131**, **132**, by controlling a chuck temperature of a chuck (Abstract) on which the substrate resides during the processing, comprising:

circulating a thermal transfer media **115**, **151** at a thermal transfer media temperature through the substrate chuck to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (Fig. 18; col. 16, lines 29-48);

sensing the chuck temperature from three chuck temperature sensing locations **152**, **153**, **154** within the chuck -- as further limited by instant claims 2 and 3 (Fig. 18);

reporting the sensed chuck temperature to a controller **119**, where the controller is operable to adjust the process energy **130**, **131**, **132** and the thermal transfer media flow rate and the thermal transfer media temperature (col. 9, lines 11-24); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to first adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to bring the sensed chuck temperature within

the desired temperature range (col. 9, lines 11-24). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

Regarding claim 4, the temperature sensor **155** is disposed "on **a** surface" of the chuck (Fig. 21). In order for the sensor to in the chuck, the sensor must be in contact with "a" surface of the chuck. Therefore the literal meaning of the limitation is met.

Regarding claim 5, the method of claim 1 wherein the desired temperature range is between about fifty centigrade and about five hundred centigrade (col. 18, lines 3-12).

Regarding claims 7 and 8, the controller is used to the thermal transfer media flow rate and the thermal transfer media temperature and the process energy to heat and cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 9, lines 11-24). While **Arami** does not indicate if the thermal transfer media flow rate or the thermal transfer media temperature is adjusted first, it has been held that the selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. See *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946). Claims 7 and 8, as well as the specification, suggest there exists no criticality as to whether the flow rate or the temperature of the thermal transfer media is first adjusted.

5. Claims 1, 3, 4, 7, and 8 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,435,379 (**Moslehi** et al.).

Regarding claims 1 and 3, **Moslehi** discloses a method for controlling a substrate temperature (Abstract) of a substrate **19** (Fig. 3) during processing of the substrate at a process

energy (col. 3, 14-27) by controlling a chuck temperature of a chuck (Abstract) on which the substrate **19** resides during the processing, comprising:

circulating a thermal transfer media **22** at a thermal transfer media temperature through the substrate chuck **18** to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (Fig. 3; col. 3, line 42 to col. 4, line 7);

sensing the chuck temperature from at least one chuck temperature sensor **48** within the chuck **18** -- as further limited by instant claims 3 (Fig. 3);

reporting the sensed chuck temperature to a controller **50**, where the controller is operable to adjust at least one of the thermal transfer media flow rate and the thermal transfer media temperature (Fig. 4; col. 3, line 42 to col. 4, line 7; col. 4, lines 39-56); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to first adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, to bring the sensed chuck temperature within the desired temperature range (col. 3, line 42 to col. 4, line 7; col. 4, lines 39-56). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

Regarding claim 4, the temperature sensor **48** is disposed "on **a** surface" of the chuck (Fig. 21). In order for the sensor to in the chuck, the sensor must be in contact with or on "a" surface of the chuck. Therefore the literal meaning of the limitation is met.

Regarding claims 7 and 8, the controller is used to the thermal transfer media flow rate and the thermal transfer media temperature and the process energy to heat and cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (Abstract; col. 3, line 42 to col. 4, line 7; col. 4, lines 35-56; col. 9, lines 43-54). While

Moslehi does not indicate if the thermal transfer media flow rate or the thermal transfer media temperature is adjusted first, giving however examples wherein both are adjusted, it has been held that the selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. See *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946). Claims 7 and 8, as well as the specification, suggest there exists no criticality as to whether the flow rate or the temperature of the thermal transfer media is first adjusted.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-3, 5, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,605,600 (**Muller** et al.) in view of **Arami**.

Regarding claims 1-3, **Muller** discloses a method for controlling a substrate temperature (col. 1, lines 43-55) of a substrate **104** (Fig. 4) during processing of the substrate at a process energy ("RF power" for etching; col. 2, lines 7-26), by controlling a chuck temperature of a chuck **105** on which the substrate resides during the processing, comprising:

circulating a thermal transfer media at a thermal transfer media temperature through the substrate chuck to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (col. 1, line 56 to col. 2, line 6; col. 2, lines 27-41);

sensing the wafer temperature from at least one wafer temperature sensing location at the chuck, (Fig. 3);

reporting the sensed chuck temperature to a controller, where the controller is operable to adjust the process energy and at least one of the thermal transfer media flow rate and the thermal transfer media temperature (col. 5, lines 54-59; col. 7, lines 47-54); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to bring the sensed chuck temperature within the desired temperature range (col. 5, lines 54-59; paragraph bridging cols. 5-6; col. 7, lines 47-54). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

While **Muller** is silent to means of sensing the temperature of the wafer, **Arami**, as noted above, discloses an electrostatic chuck for controlling the temperature of a semiconductor wafer and teaches the benefits of measuring the wafer temperature using three locations from within the chuck in order to get better uniformity and control of the wafer temperature (Arami, col. 2, lines 44-47).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to measure the temperature of the chuck from three locations within the chuck in the method of **Muller**, in order to obtain more thorough information of the wafer temperature for better control of the process, as taught by **Arami**.

Regarding claim 5, **Muller** discloses that an exemplary desired temperature range is 145 °C (col. 3, lines 48-52), which is between about 50 °C and about 500 °C.

Regarding claims 7 and 8, the controller is used to the thermal transfer media flow rate and the thermal transfer media temperature and the process energy to heat and cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 9, lines 11-24). While **Muller** does not indicate if the thermal transfer media flow rate or the thermal transfer media temperature is adjusted first, it has been held that the selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. See *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946). Claims 7 and 8, as well as the specification, suggest there exists no criticality as to whether the flow rate or the temperature of the thermal transfer media is first adjusted.

Response to Arguments

8. Applicant's arguments filed 17 May 2004 have been fully considered but they are not persuasive.

Regarding Applicant's response to the 35 USC 112(2) rejection, Examiner respectfully disagrees that the amendment to claim 1 overcomes the rejection. To the contrary, the amendments to claim 1 only exacerbates the indefiniteness by introducing even more options.

Applicant appears to argue that Arami does not disclose a controller which controls the transfer media temperature and flow rate and the process energy. Examiner respectfully disagrees. Arami shows such a controller **119** in Fig. 18 as has been pointed out in all three Office actions. Accordingly this argument appears to be in error. In this regard, Applicant argues that 130, 131, and 132 are not process energy. Examiner respectfully disagrees. They --in fact--

are. Heat cannot be created absent energy to do so. Since this energy to heat is part of the process, it is, by definition, process energy.

Applicant appears to make the same arguments regarding the Moslehi reference, as made for the Arami reference. Again Examiner respectfully disagrees and uses the same arguments as applied to Arami. Moslehi teaches a temperature controller **50** (Fig. 3) which adjusts thermal transfer media flow rate and temperature, also controls process energy for the same reasons as indicated previously.

Applicant appears to make the same arguments regarding the Muller reference, as made for the Arami and Moslehi references. Examiner respectfully disagrees. Muller cannot control the temperature of the substrate absent a control system for so doing. Muller teaches controlling the cathode temperature to control the wafer temperature and controlling the process power via ion bombardment to control the wafer temperature. (See locations in Muller as noted in the rejection of the claims.)

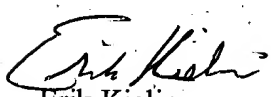
Applicant argues that the decision tree as recited in claim 1 has patentable weight and distinguishes the instant claims over each of applied references of Arami, Moslehi, and Muller in view of Arami. Examiner respectfully disagrees. The decision tree has patentable weight only to the extent that process steps are **not optional** for reasons indicated in the rejection of the claims under 35 USC 112(2) above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 571-272-1693. The examiner can normally be reached on 9:00 - 19:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erik Kielin
Primary Examiner
17 May 2004